

LASER SUPPORTING ATTACHMENT
FOR VEHICLE ALIGNMENT SYSTEM

1 BACKGROUND OF THE INVENTION

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3 The present invention relates generally to wheel
4 alignment systems and more particularly to a laser-
5 based wheel alignment system having a laser supporting
6 attachment for a vehicle wheel spindle or hub.

7 The axes about which the front wheels of an
8 automobile or truck turn as it travels down the road
9 must be carefully set to minimize tire wear and insure
10 safe and stable handling characteristics. The
11 orientation of these axes is determined by three
12 angles: 1) the toe-in angle, which specifies the angle
13 between the rim of the wheels and a line drawn
14 parallel to the direction in which the car is pointed;
15 2) the camber angle, which specifies the angle between
16 the rim of the wheels and the vertical; and 3) the
17 caster angle, which specifies the angle between the
18 vertical and the axis about which the individual
19 wheels turn when changing direction. These angles are
20 typically specified individually for each wheel and
21 for each model and make of vehicle and must be
22 periodically tested and reset as the vehicle and tires
23 age to insure continued economic and safe vehicle
24 performance.

25 The alignment of the steerable wheels of motor
26 vehicles with respect to camber, toe-in and caster
27 measuring devices of axle measurement equipment must
28 assume a position accurately defined with respect to
29 a vehicle part. Prior art installations include
30 fastening plates for the mounting of the measuring
31 devices. The alignment of the plane of the fastening
32 plate takes place parallel to the plane of the outer

1 surface of the respective brake drum of the wheel at
2 a distance by means of abutment pins connected with
3 the fastening plate. In order that the end faces of
4 the abutment pins are able to abut at the flat-
5 machined reference wheel surface hub without having to
6 disassemble the vehicle wheel, the wheel disk is
7 provided with correspondingly constructed bores,
8 through which extend the abutment pins. Arms with
9 hook-shaped ends are used in the fastening of the
10 installation to the wheel and extend about apertures
11 of the wheel disk and are connected with the fastening
12 plate. In this manner, the measurement equipment
13 mounted on the fastening plate is retained supported
14 on the brake drum or the wheel hub. It is thereby
15 disadvantageous and costly in that it is not possible
16 in practice to control the abutment of the end faces
17 of the contact pins on the reference surface with
18 simple mechanical means since the abutment surface is
19 not freely accessible. If the abutment of all
20 abutment pins on the reference surface is not assured,
21 then incorrect adjustments of camber, toe-in or caster
22 may result therefrom when unevenness of the reference
23 surface are not noticed or dirt particles or metal
24 chips are disposed between abutment pins and abutment
25 surface or if the installation rests tilted or canted
26 in the bore holes.

27 The present invention attaches a laser module
28 directly to the vehicle wheel spindle or hub to
29 provide a more accurate positioning of the laser.
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1 SUMMARY OF THE INVENTION

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3 A vehicle laser alignment system laser supporting
4 attachment for mounting a laser module to either the
5 wheel spindle or hub of a vehicle has a plurality of
6 attachments for attaching to different vehicles. A
7 laser module supporting mandrel has a cradle for
8 supporting the laser module on one end and a mandrel
9 to wheel adapter connection on the other end thereof
10 and has a slot formed in the side of the mandrel. A
11 mandrel-to-wheel adapter is selected for a particular
12 vehicle and is removably attached to the mandrel on
13 the mandrel-to-wheel adapter connection for attaching
14 the mandrel to a specific vehicle. An adapter holding
15 plate has a threaded opening therein and is sized to
16 fit into the mandrel slot for bolting the mandrel to
17 a specific mandrel-to-wheel adapter on one end of the
18 mandrel. The threaded bolt removably fastens the
19 mandrel-to-wheel adapter to the mandrel by bolting
20 through the mandrel-to-wheel adapter into the adapter
21 holding plate. The mandrel-to-wheel adapter can be
22 rapidly changed for threadedly attaching the mandrel
23 to the end of a threaded spindle or for bolting the
24 mandrel onto the wheel hub.

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26 BRIEF DESCRIPTION OF THE DRAWINGS

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28 Other objects, features, and advantages of the
29 present invention will be apparent from the written
30 description and the drawings in which:

31 Figure 1 is a perspective view of a laser
32 supporting attachment according to the present
33 invention attached to a wheel spindle;

1 Figure 2 is an exploded perspective view of a
2 laser supporting attachment of Figure 1;

3 Figure 3 is an exploded perspective view of a
4 laser supporting attachment having a hub attaching
5 adapter; and

6 Figure 4 is a cutaway elevation of the laser
7 supporting attachment attached to a vehicle wheel.
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9 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT
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11 Referring to the drawings and especially to
12 Figures 1 and 2, a laser supporting attachment for a
13 vehicle alignment system is illustrated attached to
14 the end of a spindle 10 of a vehicle wheel 11. A
15 laser module 12 has a laser 13 and bubble levels 14
16 and is attached to a laser supporting mandrel 15.
17 The mandrel 15 has a spindle attaching adapter 16
18 attached to one end thereof for attaching the mandrel
19 15 to the wheel spindle 10. In the case of Figures 1,
20 2 and 4, the adapter 16 is a cylindrical adapter
21 having a threaded bore 17 in one end with threads
22 sized to fit on the threaded end of the spindle 10.
23 The adapter 16 has a supporting annular lip 18 and has
24 a bore 20 passing therethrough for receiving a nut 21.
25 The mandrel 15 can be seen having a laser module
26 cradle 22 formed on one end thereof and having a bore
27 23 through the bottom thereof for receiving a nut 24.
28 The laser module 12 is supported in the cradle 22, as
29 seen in Figure 1, and the bolt 24 is passed through
30 the opening 23 and threaded into the bottom of the
31 laser module 12 for supporting the laser module on the
32 end of the mandrel 15. The mandrel 15 also has a slot
33 25 in the other end portion thereof sized to receive

1 an adapter holding plate 26, shaped similar to a T-
2 bar, and having a threaded opening 27 in the center
3 thereof. The top of the plate 26 has the general
4 curve as the cylindrical mandrel 15. The adapter
5 holding plate 26 is slipped into to the slot 25 so
6 that the adapter 16 can be positioned on the end of
7 the mandrel 15 supported by the lip 18 sliding into
8 the end of the cylindrical mandrel 15. The bolt 21
9 is passing through the bore 20 and bolted into the
10 threaded opening 27 in the adapter holding plate 26.
11 This allow the mandrel 15 with the adapter 16 to be
12 attached to the end of the spindle 10 onto the
13 threaded portion 30 after removing the grease cap that
14 normally covers the end of the spindle. Once the
15 laser module 12 supporting mandrel 15 with the adapter
16 16 attached thereto is attached to the threads 30, the
17 laser is then used in a laser alignment system by
18 directing the laser at positioned targets for
19 adjusting the toe-in angle and the camber and caster
20 angles of the wheel.

21 The present invention, however, is a universal
22 laser module mounting system in which a variety of
23 adapters 16 can be attached to a mandrel 15 for
24 different vehicles having different wheel
25 configurations.

26 Turning to Figures 3 and 4, an alternate
27 embodiment 31 of a laser supporting attachment for a
28 vehicle alignment system is illustrated in which the
29 mandrel 15 has the laser module 12 fitting into the
30 cradle 22 and anchored with the bolt 24 in the same
31 manner as shown in Figures 1 and 2. The mandrel 15
32 has slot 25 and an identical adapter holding plate 26
33 for sliding thereinto. However, a different adapter

1 32 is attached to the mandrel 15 for mounting the
2 mandrel 15 to a wheel hub of a vehicle 33. The hub
3 mounting adapter 32 has a bore 34 therethrough for
4 receiving the nut 21 and also has a supporting lip 35
5 around one end. Adapter 32, however, has a hub
6 mounting flange 36 having a plurality of openings 37
7 positioned to fit over the studs of a particular wheel
8 hub for mounting the laser supporting attachment 31 to
9 the vehicle 33 wheel 38 for supporting the laser
10 module 12 for use in aligning a vehicle wheels 38.
11 The adapter plate 32 is attached to the mandrel 15
12 with the bolt 21 passing through the bore 34 and is
13 attached to the threads 27 of the adapter holding
14 plate 26.

15 The present laser supporting attachment for
16 vehicle alignment systems advantageously allows the
17 same laser module and attaching mandrel to be used for
18 any desired vehicle used with a small number of wheel
19 adapters. The present invention advantageously
20 attaches the laser module directly to the spindle or
21 at the end of the hub to avoid the runout of other
22 systems which attach laser modules to the wheel rim or
23 to the tires and thereby provides a more accurate
24 alignment system. However, the present invention is
25 not to be construed as limited to the forms shown
26 which are to be considered illustrative rather than
27 restrictive.